DECEMBER 7, 1960

GAS IN INDUSTRY

Supplement to the "GAS JOURNAL

Vol. 3 No. 31

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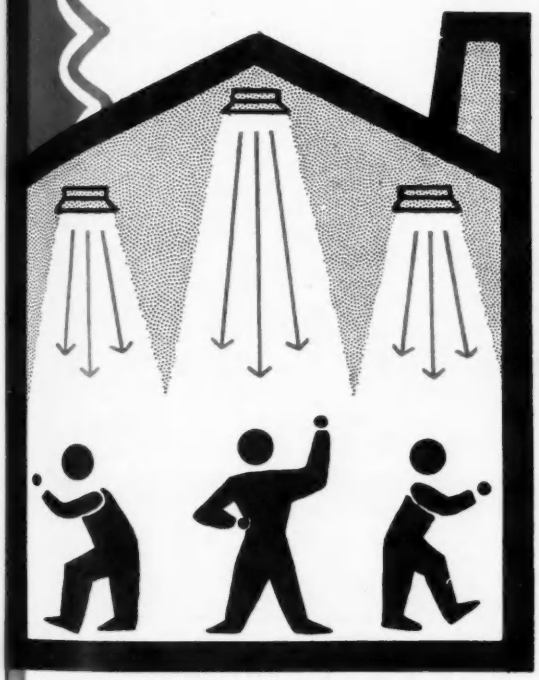

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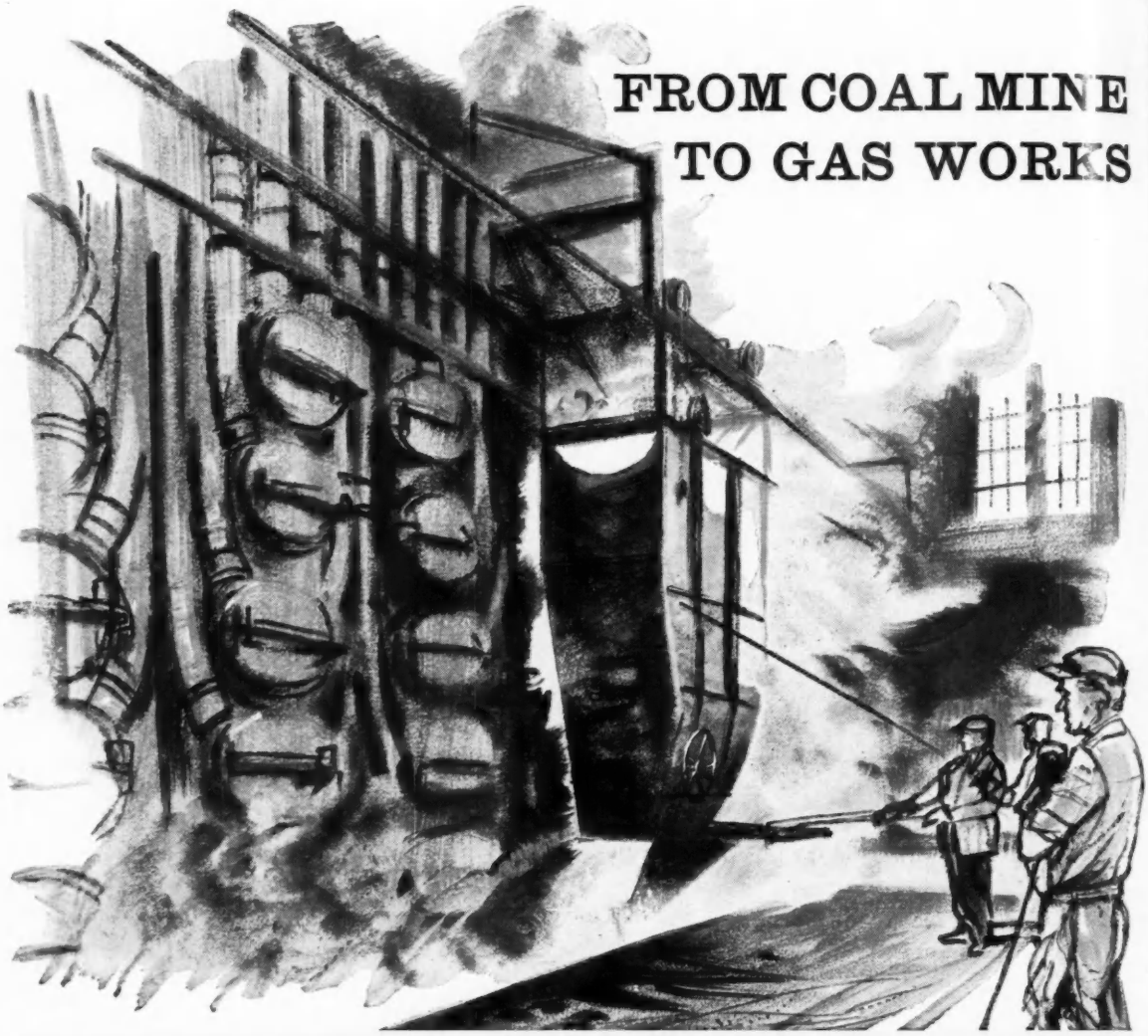

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GAS IN INDUSTRY

DECEMBER 1960

Vol. 3 No. 31

FEATURES

BASILDON FIRMS FIND MANY USES FOR GAS
By Eric Ford

HOLD-UP FOR MEREDITH & DREW AVERTED

THE INVISIBLE HAND OF SAFETY

THEY'RE BANKING ON GAS

HEATING FERROUS METALS
By E. A. K. Patrick and N. G. Patel

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Editorial

Gas and oil in harness

THERE is nothing particularly new in the idea of an industrial burner which will run on both fuel oil and gas, using each fuel separately; that is to say, the ability to use either fuel as a standby to the other. Such an arrangement might be attractive to industrialists, who have installed oil firing for their furnaces but wanted to make sure of a continuity of heat supply should oil become difficult to obtain. It would not be particularly attractive to the gas industry which would be interested in obtaining a reasonably lucrative gas load as well as supplying a valuable service.

Interest in the possibilities of alternative supplies has grown, particularly in the United States where oil may be used as a standby to natural gas, especially during the winter when the 'interruptible' tariffs come into force during peak domestic load periods. In this country the Suez crisis gave an impetus to the possible 'temporary' change from oil to gas.

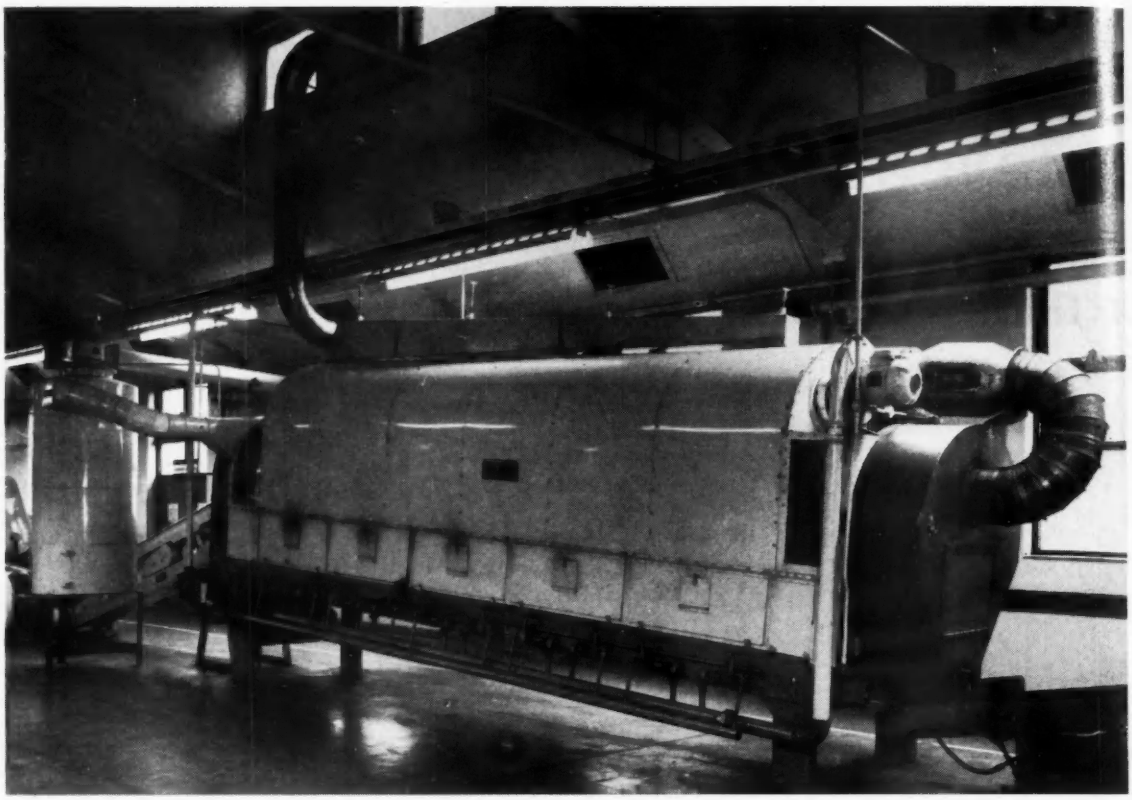
The idea of burning both fuels simultaneously is of far greater interest to the gas industry, since increased loads are possible, varying with the proportion of gas to oil used in any individual furnace. Though this is both possible and practical, before any such process could be put forward as suitable for the industrialist, something at any rate must be known of the effect of the combined fuels on the management of the furnace and on the workpiece itself.

Is the fuel consumption going to be higher? What will be the effect on the stability of the flames? Will there be additional scale formed on the metal being treated? These are the kind of questions which have to be answered, and in order to do so Mr. E. A. Patrick and Mr. N. G. Patel, of the Gas Council's industrial laboratory at Watson House, London, have carried out a programme of research, published in a paper read at the Autumn Research Meeting of the Institution of Gas Engineers, an abstract of which will be found in this issue.

An account is given of work carried out in an experimental furnace using a commercial burner obtainable on the market and not specially designed for the experiments. Results show that there is a distinct advantage to be gained from the simultaneous use of both fuels. The stability of the oil flame, only satisfactory with an excess air intake of up to 30%, was greatly improved by introducing town gas; a 3% gaseous heat input reduced the excess air needed to 3%, and with 10½% town gas to less than 1%. Combustion conditions inside the furnace were improved and so the oxidising effect on the workpiece was reduced without causing smoke. The low sulphur content of the town gas also reduced proportionally the sulphur dioxide in the flue gases.

The greater part of the paper, however, is concerned with the relative deposition of scale on the ferrous workpieces. Both the quality and the quantity of scale formed are clearly most important, since not only must the loss of metal be as low as possible, but subsequent descaling must be easy and cheap to carry out.

The paper shows that the addition of town gas to the fuel oil reduces the weight of scale considerably and gives a better final surface. The longer life of the furnace refractories is a further advantage to be gained from the dual fuel burner.



In this well-laid-out plant, tobacco is dried at the Carreras Ltd. factory at Basildon. The tobacco enters the oven at left and moves through a revolving cylinder inside. After drying, the tobacco leaves the oven by the impulse conveyor (bottom right).

BASILDON

IT is only to be expected that the new towns, with their up-to-date approach to the problem of planned community life, in which residential and industrial sectors are carefully integrated, should have tended to attract a considerable proportion of the newer industries.

This is certainly the case at Basildon, one of the most recent of the new towns to be designated, where not only are many of the factories engaged in catering for the new industries which are typical of the modern world, but those firms which are engaged in what may be termed the traditional occupations are employing the most up-to-date production techniques in their operations.

Considerable satisfaction can therefore be derived from the fact that gas has been widely selected as the fuel for many of these industries, both old and new.

Used alike for process work in the factory production lines and for such services as space heating, hot water supply and canteens, gas is already playing an important part in the industrial life of this new town.

The North Thames Gas Board, in whose area Basildon is situated, can be expected to supply still larger quantities of gas as industrial expansion continues in this still-growing town.

Among the many factors which are taken into consideration when a firm is considering whether to establish premises in a new town is the question of an adequate fuel supply.

The advantages of gas, which include its flexibility and ease of control, have clearly impressed many firms on the Basildon No. 1 Industrial Estate, which is now nearing completion. Another factor which must have influenced firms in their choice of fuel is the availability of supply and service at Basildon, to which reference was made in a previous article.

No. 1 Industrial Estate is supplied by a 24-in. main which will eventually also supply the No. 2 Industrial Estate, now at the planning stage.

A series of 8-in. and 12-in. feeders supply the existing estate, so that wherever a factory is situated it is assured of an adequate supply of gas. One of the larger firms, in fact, is supplied by 12-in. service pipe.

Basildon has been largely conceived as a centre for light industry and, in fact, most of the factories fall into this category, even though some are producing the lighter components for heavy industry centred elsewhere.

The term 'light industry,' however, does not necessarily imply manufacture in small factories, and some of the plants at Basildon are very large indeed and consume considerable quantities of gas.

An example is the large and well-designed works of Marconi's Wireless Telegraph Co. Ltd., which occupies a prominent position at the corner of the estate, facing the London—Southend arterial road.

This internationally-famous Company has established its entire Aeronautical Division and parts of its Marine and Communications Divisions at Basildon, where its main use of gas for process work is for the

stoving of metal parts used in the construction of industrial equipment.

A Barlow Whitney three-pass conveyor oven has been installed in a separate room, built on to the main paint shop at first storey height. The oven is thus separated from the spray booths and the rest of the equipment in this shop.

By means of ingenious mechanical handling arrangements, based on a Teleflex conveyor system, the operation of the oven has been made entirely automatic.

Paint spraying takes place at floor level in the adjacent paint shop and the sprayed objects are placed on the continuously moving trays travelling on the Teleflex conveyor.

They move up from the painting area and through an aperture in the wall before turning at right angles to enter the oven. After the appropriate stoving period, the articles leave the oven at a position opposite to the point of entry and return via the conveyor to the paint shop floor for off-loading.

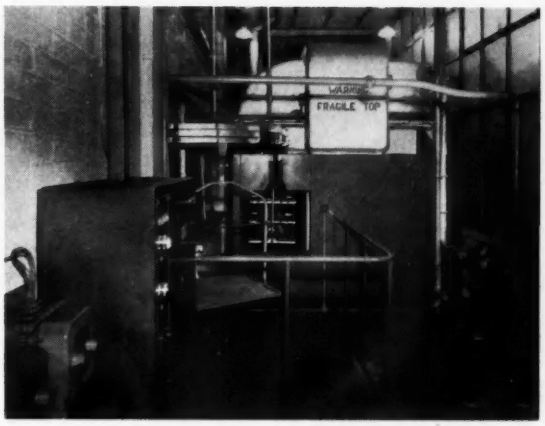
This oven has a roof-mounted air recirculation fan and is direct fired through an air blast tunnel burner—a method which is somewhat unusual for this particular application. The oven has a maximum working temperature of 400°F.

A control panel is sited in the paint shop at floor level, so that it is unnecessary for the operator to ascend to the floor above except in unusual circumstances. The facilities include a temperature recorder/controller.

Safety arrangements are comprehensive, including an overriding safety thermostat in the air ducting, while an airflow switch takes care of possible fan failure.

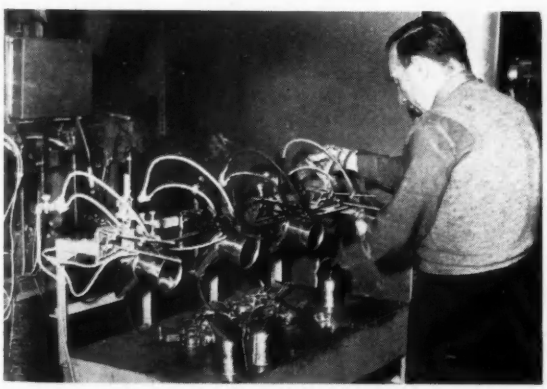
There is an explosion relief panel in the roof and the oven has a fully protected lighting sequence with purging period.

Marconi's Wireless Telegraph Co. Ltd. have obviously given considerable thought to the siting of this stoving oven which is notable for economy in



Barlow Whitney stoving oven in use at Marconi's Wireless Telegraph Co. Ltd. After spray painting in the paint shop on the ground floor the items are placed on trays, seen entering the oven.

FIRMS FIND MANY APPLICATIONS—



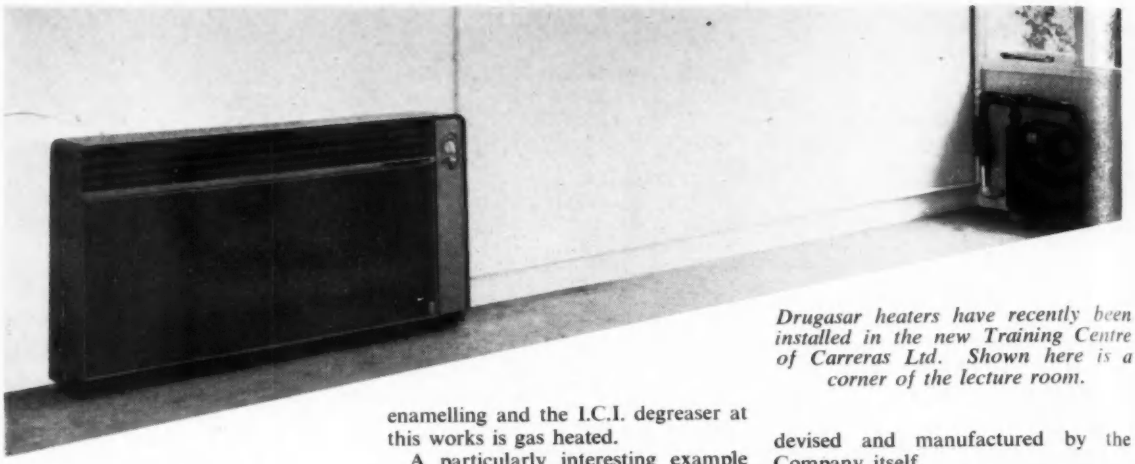
A piece of equipment devised and manufactured by Paramount Metal Works, for soldering handles on to small cans. The cans are merely placed on mandrels and the rest of the operation is automatically timed and controlled.

ERIC FORD says—

'Used alike for process work in the factory production lines and for such services as space heating, hot water supply and canteens, gas is already playing an important part in the industrial life of this new town.'

—for

GAS



Drugasar heaters have recently been installed in the new Training Centre of Carreras Ltd. Shown here is a corner of the lecture room.

the amount of space it occupies in a busy works and the convenience in operation as part of an integrated production line.

Elsewhere in the works, the Company makes considerable use of gas-fired torches in such applications as 'wire-burning' and tinning.

Stoving applications for gas are found in a number of other factories on the estate—evidence of the increasing popularity of gas in this particular application in modern industry.

One Basildon firm of stove enamellers to the trade has chosen gas for its process work, the equipment in use including an infra-red stoving plant and a gas-fired oven with dimensions of 6 ft. × 5 ft. × 5 ft.

A degreaser is an important piece of equipment when preparing metal for enamelling and the I.C.I. degreaser at this works is gas heated.

A particularly interesting example of the way in which gas-fired stoving equipment can be adapted to suit the needs of a particular production line can be seen at the works of the Paramount Metal Works Ltd., manufacturers of domestic tinware.

This enterprising firm has incorporated a Parkinson Cowan infra-red stoving tunnel oven into an automatic production line for spray painting and stoving of small domestic tinware articles.

For stoving

Articles for stoving are suspended on hooks fixed to a Teleflex conveyor which carries them slowly past an electrostatic paint spray gun which automatically moves up and down, being operated by an ingenious device devised and manufactured by the Company itself.

The paint is therefore sprayed up and down the vertical length of the article. At the same time, by means of a rack system incorporated in the conveyor, the items to be sprayed are slowly rotated so that paint is sprayed round the circumference of the article.

After spraying, the articles pass through the tunnel, which has a total length of nine feet, comprising three sections of 3 ft. each.

Stoving time is three minutes and after leaving the tunnel the completed articles are taken from the hooks. Manual operations therefore include only the loading and unloading of the items.

Inspection of a wide variety of finished products in various colours showed that this equipment is producing a very fine standard of finish.

Paramount Metal Works Ltd., are adepts in the application of gas to their own production requirements.

Another example is the piece of equipment they have devised and made for soldering handles on to small tin cans. This machine comprises a bench to which have been fitted four mandrels on to which the articles can be placed by the operator.

Paramount Metal Works Ltd. have designed this stoving plant in which tinware moves on the Teleflex conveyor from left to right, passes the automatically operated electrostatic spray gun (right) and then enters the stoving oven.

Gas jets

A gas jet plays on the spots required, there being two such jets, with associated pilot lights, on each mandrel. A timing device, which can be set as required, works in association with the burners, by means of magnetic valves in the high pressure gas supply.

The operator merely has to place the articles on the mandrels, time for this being allowed in the timing sequence.

The burners then play on the handles for the period required and on completion of this period, the articles are removed, fresh work substituted and the cycle recommences.

Gas is used in large quantities by the well-known cigarette manufacturers Carreras Ltd., whose 12-acre site is guarded at front and rear by the two famous 'Black Cat' statues.

A staggering number of cigarettes a day is produced by this factory, using the latest automatic machinery in well-planned production lines which have been laid down in buildings which are spacious and extremely well-lit.

Among the applications of gas at Carreras Ltd. is an impressive automatic tobacco-drying plant which forms an integral part of the production line, processing an ancillary line of leaf which is later mixed with other tobaccos to form the final product.

Before reaching the drying oven, however, a suitable proportion of moisture is added to help on the leaf cutting operation which takes place in a rotary guillotine cutting machine.

A proportion of this moisture then has to be removed before the tobacco can be used for cigarettes, and it is in this important process that the gas-fired drying oven is employed.

The chief component of this oven is a large revolving cylinder which is slightly tilted towards the discharge end so that the tobacco for drying moves gradually towards this end.

Ten banks of gas and air burners are sited in pairs below the revolving cylinders, each comprising twelve burners.

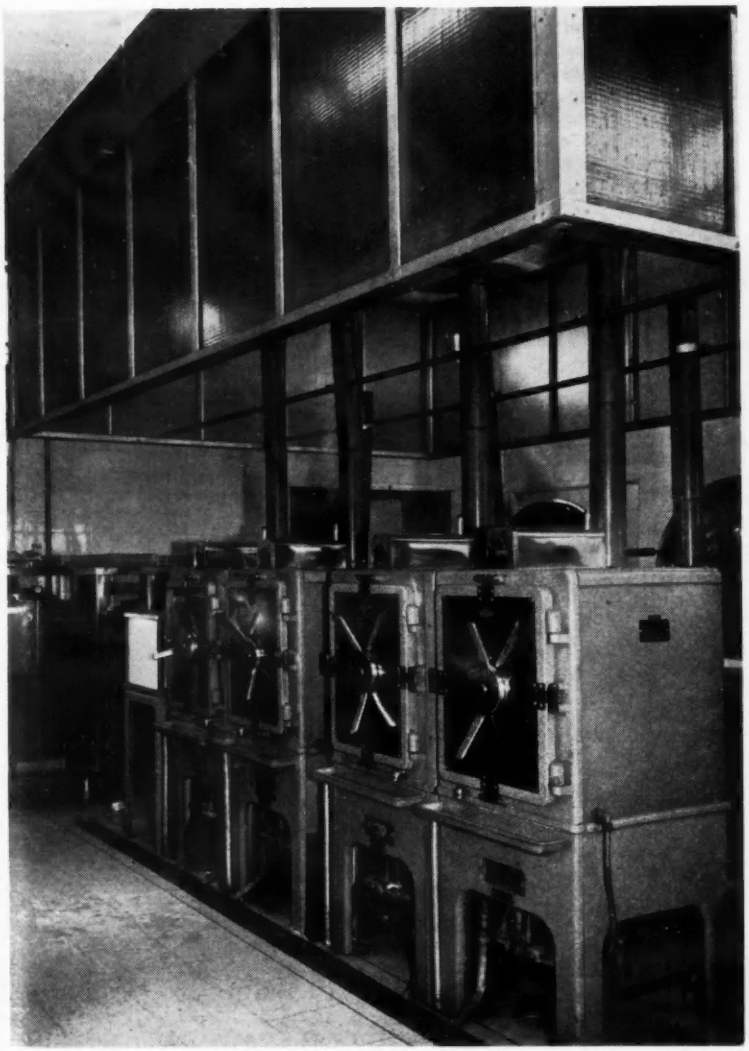
All are supplied by gas and air lines sited on each side of the oven which is fitted with thermostatic control.

There are exhaust arrangements at the entry point of the oven for the removal of dust and impurities.

Process time through the oven is about 4½ min., and operating temperatures are normally in the region 130°-140°F.

The crushed and cut tobacco stems enter the cylinder via a 'Panda' impulse conveyor and, after drying, they leave by a similar conveyor.

The tobacco is then discharged into skips and transported to another part of the plant for mixing with other tobaccos to form a product which is sold throughout the world.



There are many gas kitchens and canteens on Basildon No. 1 Industrial Estate. This outstanding example is at the works of Marconi's Wireless Telegraph Co. Ltd.

Batch ovens

Another important gas-fired drying application is found in the works of Ilford Ltd., well-known manufacturers of photographic materials and apparatus, whose products are widely distributed to the home and export market as well as to industry where photographic techniques are continually finding new applications.

In this works, gas is used for several purposes in specially designed machines while photographic spools are dried in gas-fired batch ovens after coating.

The supply to this factory is through a 15,000 cu.ft. capacity meter from an 8-in. service.

Heat treatment furnaces represent one of the most important applications of gas today, and a wide variety of gas-fired heat treatment plant is in use at Basildon, ranging from complex annealing and other treatment furnaces to small tool hardening units of the type found in any machine or assembly shop.

Heating

An example of the large use of gas for heat treatment is the well-known car manufacturing company which has established one of its factories on the No. 1 Industrial Estate at Basildon. This is supplied by a 12-in. service for process work and another 6-in. supply for the canteen.

This plant has an impressive meter house whose 50,000 cu.ft. capacity meter gives an indication of the importance gas occupies in the Company's operations.

From the meter, the gas supply is divided, one branch going to the compressor station for eventual use in heat treatment furnaces while the other passes via a 10-in. pipe, mainly for low pressure use in stoving ovens.

The heat treatment section includes an up-to-date plant for the treatment of car gears, shafts and splines, with its associated atmosphere generator.

A complete gas-and-air mixing plant

supplies upwards of a hundred torches and soldering iron stoves employed on radiator production line assembly work.

On a smaller scale, a manufacturer of surgical instruments employs gas for hardening and annealing purposes in this industry, where a high degree of skill and of precision work is required.

It might not be thought that a firm producing high-class modern furniture would require gas for heat treatment but, in fact, one such firm at Basildon has a gas-fired oven for annealing furniture springs.

By now it will be obvious that Basildon Development Corporation has contrived to attract a great variety of industrial enterprises to the No. 1 Industrial Estate.

This is in accordance with the Corporation's general policy, which is to foster a community which has the richness that comes from variety; so it is important that the employment opportunities afforded to the inhabitants should be as wide as possible.

It is interesting to note that, varied though the processes are, gas has been able to find an application wherever a reliable and flexible heat source is required.

Profile cutting

Consider profile cutting, for example, in which oxy/town gas is widely employed. A firm of boiler manufacturers at Basildon uses this equipment as does a large firm of tanker manufacturers, and a Company engaged in processing structural steelwork.

Nor should one ignore the many run-of-the-mill operations in which gas is employed in every works, such as the blowpipe torches which, commonplace as they are, nevertheless provide an indispensible service for day-to-day workshop requirements.

Where gas is used in connection with automatic assembly line work, some suitable form of conveyor system is required. One of the most widely used of conveyor systems for this purpose is that associated with the name of Teleflex Products Ltd., whose factory is also situated on Basildon No. 1 Industrial Estate.

This Company's well-known conveyor system has been adopted by factories in all parts of the United Kingdom and overseas and it is therefore hardly surprising that a number of the firms on the estate should have already installed Teleflex equipment in their production lines.

Two of these, Paramount Metal Works Ltd. and Marconi's Wireless Telegraph Co., Ltd., have already been mentioned.

It is of considerable interest to note that Teleflex Products Ltd. uses gas in the production of the very equipment which is so often used in connection with gas-fired ovens and furnaces.

Annealing

The Company's equipment includes a gas-fired cable annealing furnace, a heat treatment furnace for hardening high-speed tools and a number of blowpipe torches.

One of the most important of all light industries is clothing manufacture and there are several factories on the No. 1 Industrial Estate at Basildon.

A supply of steam for pressing is an important item in any clothing factory and gas-heated steam boilers are found in most of the clothing establishments on the estate.

Gas-fired heaters have been installed in the new extension to the firm of Technical Woodware Ltd., precision pattern makers to the motor industry. The heaters are by Harris Engineering Ltd.

The advantages, which are well-known, are that these boilers are fully automatic, flexible in operation and occupy the minimum of floor space and no fuel storage is necessary.

Gas-fired boiler

An example of this can be seen at the premises of Stylist Sportswear Ltd., a small but efficient factory situated in one of the units on the Nursery Section of the No. 1 Industrial Estate.

This firm has installed a gas-fired steam boiler in one corner of the shop to feed two steam presses, each of which is capable, when operated by the competent operator in charge, of pressing some 600 garments per day.

The boiler has a maximum pressure of 110 p.s.i. and is fitted with the usual steam-operated pressurestat.

It only requires a very brief acquaintance with the factories on Basildon's No. 1 Industrial Estate to realise that the new design for living, which is a marked feature of the new town as a whole, has its counterpart in the factories as a new approach to the question of employee comfort and convenience.

Canteens

Particularly noticeable is the attention paid to the canteen arrangements in the factories, whether the number of meals served daily is only ten or a dozen or whether, as in some of the larger establishments, the number is counted in hundreds.

Gas has achieved an enviable position as a canteen fuel in Basildon, where it is claimed that about 95% of the canteen load is met by gas.

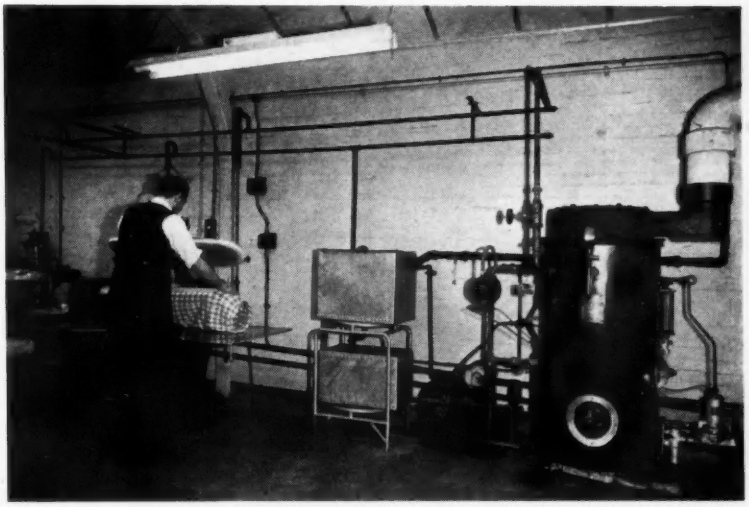
Most of the larger kitchens have been designed and installed by one or other of the well-known kitchen engineering firms along modern lines, both in respect of hygiene considerations and the kitchen staff.

An interesting feature of the canteen of one very large firm is the built-in safety arrangements in the canopy over the central cooking area.

This is fitted with a CO_2 fire extinguisher, automatically operated, which immediately puts out a fire safely and without mess. Similar arrangements have been made for the fish fryer.

A supply of hot water for toilet purposes is another requisite for an up-to-date factory.

It is interesting to note that in several factories gas is providing an alternative service for hot water during the summer period when it would be quite uneconomic to run the large boiler plant which also provides winter heating.



Gas-fired steam boilers are used in a number of clothing factories on the Basildon No. 1 Industrial Estate. This boiler is seen operating a steam press at Stylist Sportswear Ltd.

This means a useful subsidiary load for the gas supply authority in addition to the many other plants where gas has been selected as the sole fuel for space and water heating.

Reports occasionally appear in the Press of workers 'walking out' from badly-heated factories during spells of cold weather. This is unlikely to happen at Basildon where special care has been taken to provide adequate heating arrangements for all factory premises, using both unit air heaters and overhead radiant heating appliances.

A typical example is the firm of Technical Woodwork Ltd., pattern makers to the motor industry.

This Company, whose high-precision products are vital to the production of the modern motor car, has recently added a new extension to its works and is heating this with five wall-mounted Harris direct and indirect unit air heaters.

The heaters have been sited near roof level in a 60 ft. square shop and, on a particularly chilly day, when the shop was visited, the heaters were providing a comfortable degree of warmth.

Heat control

The heaters are provided with thermostatic control.

The Company also reports that, in addition to the need for heating to give comfortable working conditions, an equable temperature is needed, especially through the night, to prevent adverse effects on some of the materials used in pattern making.

One of the most important industrial problems of the present day is the way in which fresh employees, and particularly young people, are introduced to a new place of work.

The days when a newcomer is told to 'watch old Joe and pick the job up from him' are happily fast disappearing.

New methods

In Basildon, the new methods which are being introduced are worthy of the new town to which they apply. Nowhere is this better seen than at Carreras Ltd., where a new training school is nearing completion.

Gas-fired heaters are fitted in this training school which comprises a pleasant and well-lit lecture room, a workshop fitted with the various types of machines used in cigarette manufacture and the necessary administrative offices.

It is expected that up to 30 students at a time will eventually pass through the centre. Heating is by balanced flue convector heaters, thermostatically controlled.

● **This necessarily brief survey has shown something of the wide variety of industrial enterprise which is a feature of the No. 1 Industrial Estate at Basildon new town and the pattern will shortly be repeated in the No. 2 Industrial Estate. It can be expected that the North Thames Gas Board will perform the same service for the new estate as it has done for the factories which are already successfully operating on the existing estate.**

Two spans of the bridge across the River Severn from Lydney to Sharpness were destroyed after a fog mishap. To the right (foreground) can be seen fractured gas mains.

Rescue operation averts output hold-up

A LOCAL disaster threatened a complete production stoppage and severe unemployment at the Meredith & Drew biscuit factory at Cinderford (Glos.) when gas supplies were completely cut off. This serious situation was largely overcome in 120 hours, thanks to full co-operation between the Company's staff and the South Western Gas Board, plus ready assistance from local industry and machinery manufacturers.

The factory's gas supply—essential for the biscuit ovens—was cut off on the night of Tuesday, October 25, when the railway bridge across the River Severn between Lydney and Sharpness was destroyed after an oil tanker collided with the bridge in fog, with regrettable loss of life. This bridge carried the gas main supplying Meredith & Drew's factory.

It was 24 hours before the South Western Gas Board could assess the possible duration of the gas stoppage. It was estimated that the stoppage was not one of hours or even days, but would probably persist for two weeks or more.

As a result 450 local employees would have no employment, and sales orders would not be met.

Immediately steps were taken to put in hand a large scale rescue operation to provide supplies of propane gas to the factory. All levels of the Company's management, in conjunction with the gas board, suppliers of special equipment and propane gas, worked unremittingly to effect the changeover in the gas supply.

One group of women employees were asked to go to another of the Company's factories 100 miles away to ensure the continuance of some production if the propane gas proved unsuccessful.

The girls were working at Meredith & Drew's Ashby plant on Monday morning, October 31. At the same time certain machines were moved to Ashby to ensure continued production.

Experiments had to be carried out to assess what changes had to be made in the burners fitted in the ovens to enable them to use propane gas, which has different characteristics from town gas.

A total of 600 burners had to be modified and a local firm worked all through the night making the neces-

sary parts. Many hundreds of miles were covered by the senior staff to find various types of auxiliary equipment.

Technical and maintenance staffs worked round the clock to make the necessary changes for the first production runs of propane gas. The first oven to be successfully converted was lit on Sunday night, October 30—five days after the disaster.

During this period it was necessary to explain to the staff that, in the emergency, the Company was compelled to give them technical notice from Thursday afternoon.

This was to be effective from the following Thursday in order that employees could draw unemployment pay as quickly as possible. This step was taken because in the early stages of the crisis, the Company could not be certain that propane gas would be satisfactory.

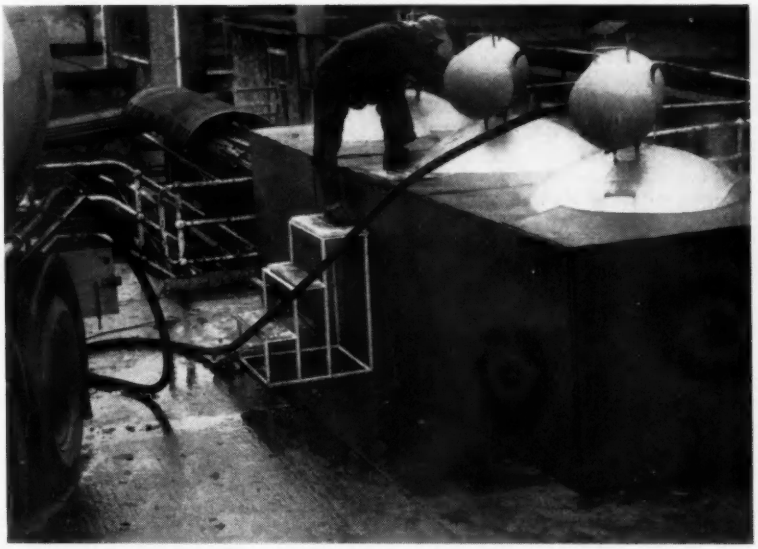
In consultation with the trade unions and Ministry of Labour, Meredith & Drew undertook to make up the difference between unemployment and normal pay.

Limited production on one oven was resumed at Cinderford on October 31—using propane gas, and a second oven began working on November 2.

As a direct result of efforts of many people, both inside and outside the Company, there was only limited interruption to the flow of supplies, and full employment was maintained.

The South Western Gas Board successfully made a temporary connection across the breach in the main on November 8.

A new permanent main is being laid from Gloucester, 16 miles away, and should be completed by the end of the year.



Heavy tankers ran a continuous service to Meredith & Drew's factory at Cinderford bringing the emergency gas supplies which were pumped into temporary storage tanks.

Britain's first . . . SMOKELESS AND ODOURLESS INCINERATOR

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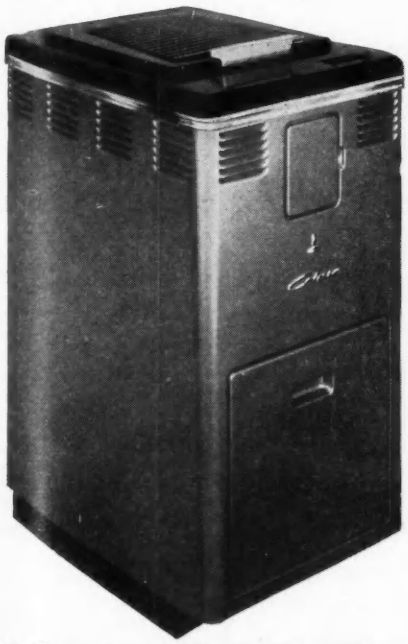

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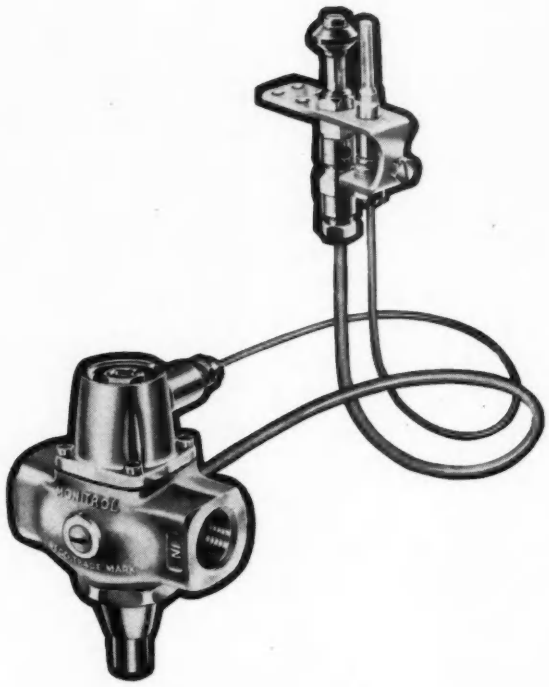


GUARDING AGAINST GAS FLAME FAILURE

A PUBLICATION describing a foolproof automatic shut-off valve—the Monitrol—specially designed as a safety device for incorporation in the main fuel supply to gas burning appliances is now available from Parkinson Cowan Measurement, a division of Parkinson Cowan Ltd.

Basically, the Monitrol consists of a main gas valve under the control of an electromagnet; the electromagnet is held operated by current generated in a thermocouple which is heated by the pilot flame used to ignite the main burner.

Only when the pilot is ignited and has generated enough heat to excite the thermocouple can the main valve be operated and the main burner ignited.

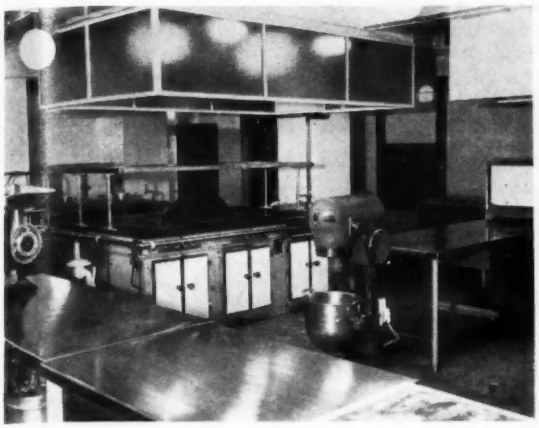
If the pilot flame is inadvertently extinguished by draught, blockage or supply failure, the electromagnet automatically releases the main valve which is then closed by a spring. Thereafter, this valve cannot be reopened until the unit is reset manually and the pilot reignited.

The Monitrol unit may be used with any normal type of gas, including butane and propane, and on all types of gas appliances—boilers, water heaters, space heaters, ovens, furnaces, etc. of any size.

It is made in ½ in. B.S.P. sizes (16 mm. dia.) for insertion in the gas line, and passes 125 cu.ft/hr. of gas at .3 in. water gauge pressure loss (4050 l./hr. at 10 mm. water gauge pressure loss.)

For appliances with greater gas consumption, it may be used in conjunction with a gas relay valve of the type without a by-pass.

The illustration shows the Monitrol flame failure device described in the brochure, now available from Parkinson Cowan Measurement.



Modern kitchens are included in the new Barclays Bank D.C.O. headquarters.

They're banking on gas . . .

THE recently opened new headquarters of Barclays Bank D.C.O. at Goodenough House, has been hailed by many leading building critics as one of the finest additions to the post war architecture of the City of London.

Planned by Ley Colbeck & Partners, with their offices in Palmerston House almost overlooking the site, the history of this building from the time when its erection was first mooted some 10 years ago, to its handing over to the Bank in September makes a fascinating and impressive story of almost insuperable problems and difficulties solved and overcome.

Stotts were entrusted with the contract for supplying and installing all of the wide range of catering equipment, which enables the caterers, John Gardners, to provide a restaurant menu comparable with that in West End establishments.

Stotts were entrusted with the contract for supplying and installing catering equipment.

CENTRAL KITCHEN

The Equipment includes:—

- **Cafeteria and waitress service counters, with dispense bar sited between the two counter areas.**
- **Vegetable, fish and meat preparation units with meat and general cold rooms.**
- **Roasting and steaming ovens, steam heated boiling pans, grillers and fish frying units.**

All the above equipment is sited in the central kitchen.

A fully equipped pastry room containing pastry ovens, mixing machinery, boiling table and stainless steel sink and bench units is sited at one side of the main kitchen.

SERVERY

The manager's servery is complete with its own hot service unit and sink unit.

The dishwashing equipment is capable of handling some 6,000 pieces of mixed crockery and cutlery per hour.

In addition to the regular cafeteria menu for the bank staff, special provisions are included for catering by waitress service for staff as well as officers and directors of the bank.

Arrangements for the adequate entertainment of customers and guests also exist.

New gas torch for industrial furnaces

AN application has been made by the Gas Council for a registered design for a novel type of gas torch, which can be used for lighting large industrial furnaces.

The suggestion was made by the West Midlands Gas Board and the torch was designed by Watson House in co-operation with the West Midlands Gas Board.

The torch is of telescopic construction so that it overcomes many of the difficulties and hazards associated with using long rigid torches.

It is made from three lengths of steel tube which telescope into each other in the closed position. The outer tube is provided with a plastic handle and an $\frac{1}{4}$-in. B.S.P. connection thread, which is suitable for use with standard flexible tubing and plug-in connector.

The method of use is to light the torch in the closed position when it is approximately 2 ft. 6 in. long, and then extend it to any required length up to 7 ft.

E. A. K. PATRICK (Officer-in-Charge) and N. G. PATEL (Chemical Engineer), Industrial Laboratory, Watson House, which is the London Research Station of the Gas Council, have been considering investigations on the application of gas-oil burners to the heating of steel for forging. Extracts from a paper on their findings are given here. They studied the effect of types of fuel (i.e. fuel oil, town gas and various mixtures of fuel oil and town gas) at differing excess air and times of heating, on the quantity and adherence of scale formed on mild steel and alloy steels.

Heating ferrous metals—town gas and/or fuel oil?

IT is a requirement of a standby burner that change of fuel should be easy, and it is, therefore, a natural development to design burners in which no change of components is necessary in order to change the fuel, this being simply effected by operation of the appropriate valves. A further step has led to the use of both fuels simultaneously in the one burner. This stage having been reached, it began to be suggested that the combined flame that has been evolved for economic reasons did, in fact, possess intrinsic virtues not possessed by oil or gas flames independently. In this country, the next fillip received by this development may be attributed to the Suez crisis.

There are some obvious advantages of a burner that can burn alternative fuels, namely, insurance against shortage of either fuel, ability to take advantage of price changes and the use of town gas for ignition and turn-down periods.

The high rating of the burners likely to be evolved makes the use of town gas for standby purposes generally unattractive to the gas industry, but other considerations give the prospect of useful additional load.

There remain, however, those claims for these burners that are based on special properties of the combined town gas/fuel oil flame, and it was these that appeared to require scientific investigation.

If it could be shown that the addition of a small proportion of the relatively high-priced town gas to a heavy oil could produce substantial benefits in the operation of the process, resulting in financial saving or increased productivity, then, since heavy oil is normally used on large units, the potential gas load involved might be considerable.

A programme of work was, therefore, initiated to assess the validity of some of the claims made for the combined flame and their relevance to British conditions.

There are two basic types of gas-oil burner available in this country: One in which gas and oil can only be burned separately, and the other in which gas and oil can be burned either separately or simultaneously, *i.e.*, as a combined fuel. A third possible type of burner is one that would operate on combined fuel only. Dual-fuel burners are those which can burn gas or oil separately, but not together, but combination gas-oil burners are those which allow gas and oil to be burned either separately or simultaneously.

In this country, gas-oil burners are, at present, of simple design in which either an adaptor forming an annular gas port, or a gas ring with a number of circular ports, is fitted around the nozzle of a conventional oil burner. This arrangement has been adopted for the sake of convenience in the production of the burners.

The advantages that have been suggested for gas-oil burners are:

1. Gas can be used for heating up furnaces from cold and so obviate smoke nuisance experienced with oil burners when fired in cold furnaces.
2. Gas is a suitable fuel for low rates of heating, and, therefore, the turn-down ratio of oil burners is extended beyond their normal limit.
3. In the event of breadown of oil-burning equipment, or shortage of oil, gas can be turned on and production continued.
4. Where heating rates are critical, *e.g.*, in the heating of heavy forgings, both highly radiant oil flames and nearly non-luminous gas flames are available.
5. Under conditions in which oil will only burn satisfactorily if a large amount of excess air is supplied, a reduction in the excess air required may be obtained by using a combined town gas/fuel oil flame.
6. The scaling loss and the harmful effects of scaling, decarburisation or spot carburisation of metal heated by oil may be minimised by heating with town gas/fuel oil flames.
7. Low-temperature corrosion of metals by products of combustion of oil may be reduced by burning gas in combination with oil, which may increase the SO_2:SO_3 ratio in the products of combustion.
8. The unburnt fuel from oil flames and the high radiation from the flame are responsible for deterioration of furnace refractories in oil-fired fur-

naces. The use of combined fuels may result in increased furnace life and also gain in thermal efficiency if it allows the application of insulating firebricks in place of the dense bricks normally employed in the construction of oil-fired furnaces.

9. The use of gas in combination with oil may improve the combustion of oil, as gas burns at a much faster rate than oil. The characteristics of the oil flames, such as heat release pattern, may be altered to give a better temperature distribution than that obtained in oil-fired furnaces.

The problems encountered in the heating of ferrous metals are: The economic use of fuel, the attainment of proper temperatures and heating rates, and the prevention of scaling and alterations in the chemical composition of the metals.

Directly fired

The majority of furnaces for heating ferrous metals are directly fired and the combustion of fuel is usually carried to completion. The furnace atmosphere comes into contact with the metal at high temperatures.

Scaling and decarburisation of the metal has a direct bearing on the cost of production. The scale itself represents a direct financial loss. Heavy expenditures are also incurred in the descaling of the metal and the removal of the decarburised layer.

The quality of the scale, *i.e.*, whether it is of the adherent or non-adherent type, is often more important than the quantity of scale. Adherent scale increases the cost of descaling, tends to be embedded in the metal during hot working, and is harmful to forge dies.

Scales also attack furnace refractories, thereby shortening the life of the furnace.

Minimise scaling

The fact that manufacturing costs could be decreased by minimising the scaling of metal and the adherence of scale has long been realised.

Various methods of heating are known to counteract scaling, such as the use of indirectly fired furnaces, heating in specially prepared furnace atmospheres, and direct heating in reducing atmospheres produced by incomplete combustion of fuel.

These methods are employed for special cases where the increased capital or running costs can be tolerated.

Other reasons against the use of these methods of heating are: The low rate of heating in indirectly fired furnaces, difficulties of charging and discharging when using specially prepared furnace atmospheres, and a tendency for the adherence of the scale to increase in reducing atmospheres.

Research on the scaling of metals at elevated temperatures, reported in the literature, is concerned with the mechanism of scale formation, and the effect of time, temperature, composition of metal, size of workpiece, composition and velocity of furnace gases, on the rates of scaling of metals and the physical and chemical nature of the scale.

Generally, the experiments were performed using gases such as carbon dioxide, oxygen, nitrogen, sulphur dioxide, steam and carbon monoxide, and hydrocarbon gases, either singly or as combinations of two or more of these gases.

Unfortunately, the scaling behaviour of metals in furnace atmospheres cannot be deduced from the experimental results available for simple gases and their mixtures, and, therefore, synthetic atmospheres, made by mixtures of simple gases, to simulate industrial furnace atmospheres have been used.

Work has also been carried out using industrial atmospheres produced from different fuels.

The adherence of scale to metals has been investigated qualitatively, but quantitative information and suitable methods of measuring adherence of scale are rarely found. The changes that accompany scaling of metals in the composition of the metal beneath the scale have also been investigated.

Conclusions

The general conclusions of the work reported in the literature on the scaling of steels may be briefly summarised as follows:—

1. The scaling of metal is mainly an oxidation process in which the metal reacts with components of the furnace gases, normally oxygen, steam and carbon dioxide. Oxygen is the most reactive of these components.

At high temperatures, the oxidising power of steam and carbon dioxide is appreciable. Steam has been found to be more active than carbon dioxide in forming scale.

2. The generally accepted mechanism of scaling is that of counter-current diffusion, the metal diffusing outwards and the oxygen inwards through the scale deposit.

The rate of scaling, therefore, depends to a large extent on the properties of the scale, such as structure, composition and melting point.

3. The scale formed on various metals is generally composed of different oxides of iron, and, depending on the conditions under which the scale is formed, three distinct layers may be identified, each differing in its appearance, structure and composition.

The uppermost layer is richest in oxygen and consists mainly of ferric oxide, the middle layer of magnetic oxide of iron, and the layer adjacent to the metal of ferrous oxide.

4. It has been shown mathematically that the relationship of scale formation with time is parabolic, so that the amount of scale increases and the rate of scaling decreases with time of heating.

This relationship is valid for initial stages of oxidation when the oxides formed are dense and have a uniform resistance to diffusion processes.

Erratic experimental results have been obtained as the thickness of scale increases, because of the appearance of fissures and 'blisters.'

Temperature

5. Increase in temperature generally increases the extent of scale, and the scaling of mild steel becomes considerable above 800°C. Within a certain limited range of temperatures, a decrease in the scaling with increase in temperature has been observed for certain atmospheres.

6. Above a certain critical value, the velocity of the gas stream has a negligible effect on the scaling of metals. This critical value is of the order of 5 ft. per minute, but depends on the nature of the scaling gases and the temperature.

7. Scaling loss is independent of the shape of the workpiece and is generally proportional to the area of the metal exposed to the furnace gases.

8. In the presence of reducing gases, such as carbon monoxide, hydrogen and hydrocarbons from incomplete combustion of fuel, the scaling of metals is less severe than in oxidising gases only.

9. The effect of sulphur dioxide in the furnace atmosphere from sulphur-bearing fuel is to increase scaling, and the scale formed in such atmospheres is composed of sulphides and oxides of iron.

More severe

Scaling in atmospheres containing sulphur dioxide is particularly severe at high temperatures and when the concentration of free oxygen is low.

Under these conditions, iron oxide and sulphide form an iron oxide/sulphide eutectic at the scale-metal interface, and, because of the low melting-point of this complex (930°C.), a molten layer of scale is formed that has a low resistance to diffusion of iron and oxygen, and, therefore, causes a rapid increase in scale formation.

10. The scale formed in reducing or low-excess air atmospheres is generally more adherent than that formed in high-excess air atmospheres.

A tight, dense scale, tends to be more adherent than loose, porous scale. The adherence of scale is considered to be due to the penetration of the scale into the metal along the grain boundaries.

The eutectic type of scale referred to above is responsible for strongly adherent scale because of the intense intercrystalline penetration of the scale into the metal.

11. The changes in the composition of the metal surface beneath the scale occur by diffusion of metal or carbon outwards, or penetration of scale inwards.

Relative rates

The final results will depend on the relative rates of scaling and changes that occur in the metal underlying the scale during its growth.

The most important effect is decarburisation, which is found normally to decrease in the presence of scale.

12. Scaling behaviour of alloy steels cannot be generalised, as each alloying element and the proportions of these elements will affect scaling characteristics. Some elements, such as chromium, aluminium and silicon, form a protective oxide layer on the surface and reduce scaling.

The extent to which various alloys are protected by this oxide layer will depend on its stability, which is governed by the temperature and the composition of the furnace atmosphere.

The furnace consisted of a frame of mild steel with brickwork of insulating refractory. A refractory coating was applied to the inside surfaces of the furnace to protect the brickwork and to reduce the leakage of air through the furnace walls.

Gas-oil burner

The combination gas-oil burner can burn either gas or oil separately, or simultaneously using any proportion of each fuel. The combustion air is supplied through an annular outlet positioned between the oil orifice and the annular gas orifice. A simple air register allows secondary air to be induced into the furnace. The burner was set in a refractory quarl provided with a lighting port. The oil pressure was maintained at 5 p.s.i.g.

The oils used were a 200-second and a 900-second fuel oil at temperatures of 150° and 220°F. respectively. The town gas supply to the burner was governed to 2½ in. w.g., and metered. Primary air was supplied at about 25 in. w.g. Air rates to the burner, when required, were measured by means of an orifice meter. Secondary air, apart from the leakage air, was allowed to be induced into the furnace, if required, though a secondary air port of the furnace and the air register of the burner.

Since it was a cardinal feature of the claims made for the combined flame, that the addition of a relatively minor proportion of town gas to an oil flame would permit an appreciable reduction in the minimum excess air required for combustion of oil without smoke formation, it was clearly necessary to control the excess air entering the furnace. The first step was the sealing of the furnace walls.

The results of the investigation show that it is practically impossible to maintain a stable oil flame under the conditions of low furnace temperature—600° to 650°C.—and large combustion-chamber volume—120 cu.ft.—unless secondary air is allowed to enter the furnace.

When the flame was stabilised by this means, the minimum excess air was found to be about 17%. At higher furnace temperatures (860° to 940°C.), it was possible to burn oil satisfactorily without the stabilising influence of the secondary air, but again a minimum of about 17% of excess air was necessary.

Flame stability

The governing factor for the minimum excess air requirement was the flame stability.

When the combustion chamber was reduced to 20 cu.ft. particularly at the temperatures used for heating of ferrous metals for forging, a satisfactory combustion of oil was achieved with a minimum excess air of 1 to 2%.

The effect of the addition of town gas to oil flames was investigated for conditions that demanded a high minimum percentage of excess air for the combustion of oil. For 200-second fuel oil the simultaneous combustion of gas and oil led to a reduction in the minimum excess air from 17 to less than 1%; the heat supplied by gas to produce the effect was about 9% of the total heat load.

Similar conclusions may be reached for 900-second fuel oil. The addition of gas alone to an unstable oil flame does not help to stabilise the flame, but, if the stoichiometric quantity of air for the combustion of gas is also supplied, then the flame is stabilised.

A minimum of 7% heat supply by gas was necessary to stabilise the oil flame; below this limit, the flame remained unstable.

Having established the performance of the burner, a programme of work was drawn up to study the metallurgical aspects of the effect of the various flames on steels heated to forging temperature.

Forging temperatures were chosen as likely to produce the most severe attack on the metal. The variables involved are the type of steel, the period of heating, the type of fuel and excess air, of which the last two together determine the composition of the furnace atmosphere in contact with the steel.

Mild steel

Ordinary bright mild steel was selected for the majority of the trials. This steel has a comparatively smooth and clean surface, is cheap and readily available.

In addition, samples of known composition were made available of two plain carbon steels having low (En 32B) and medium (En 8) carbon content respectively, and one alloy steel (En 26 Ni-Cr-Mo).

These are referred to in this paper as 'special steels', but, since the quantities available were limited, the results for these steels were obtained using a fewer number of samples.

Throughout the experiments, the furnace temperature was measured and controlled to 1,200° ±10°C. It fell rapidly below this value on opening the furnace door for the removal of the samples, but was soon regained. A survey of the carbon dioxide content of the furnace atmosphere showed that it was fairly uniform, particularly in the region where the steel samples were placed. The composition of the furnace atmosphere was then calculated from the excess air.

Adherent scale

For bright mild steel the quantity of adherent scale when using fuel oil as the heating medium at low excess air is higher than that at 30% excess air and may be attributed to the change in the nature of scale due to the formation of a low-melting-point iron oxide/sulphide eutectic at the metal-scale interface.

The adherence of scale is due to intergranular penetration of the scale, and in the case of the molten type of scale formed in the sulphur-rich fuel-oil furnace atmosphere under conditions of low excess air this penetration is very severe. Furthermore, porous scale is regarded as being less adherent than the compact type of scale.

The heating of bright mild steel by

town gas resulted in a much lower quantity of adherent scale than heating by oil, at low excess air, and this applies in the case of 4-hour heating even at 30% excess air.

The quantity of adherent scale for the combined fuels in comparison to that for oil depended on the conditions of heating, and no general conclusions can be drawn from the results.

A noticeable reduction in the quantity of adherent scale is observed on addition of gas to fuel oil for two- and four-hour heating periods at 10% excess air and also at 30% excess air for the latter period of heating the reduction being of the order of 30 to 40%.

For the plain carbon steels heated by fuel oil, the quantity of adherent scale is high at about 10% excess air, and as the excess air is either increased to 30% or decreased to 5% the quantity of adherent scale is reduced.

By town gas

Town gas heating showed a peak in the quantity of adherent scale at about 5% excess air except for the ½-hour heating periods. This result does not agree with that obtained for bright mild steel.

The addition of town gas to fuel oil either increases or decreases the quantity of adherent scale depending on the period of heating and excess air.

For plain carbon steel (En 8) two conditions of heating, namely four hours at 10 and 30% excess air, show a marked decrease in the quantity of adherent scale on conversion from oil to combined fuels, the decrease being of the order of 60% for the 10% excess air condition.

The alloy steel results show that generally the variation of the quantity of adherent scale with excess air and type of fuel is less than that of plain carbon steels.

Primary object

While the primary object of the work was to investigate some of the merits claimed for the combined town gas/fuel oil flame, the results have also enabled some conclusions to be drawn concerning the relative merits of straightforward fuel oil and town gas for the heating of ferrous metals. It might well be that these conclusions will be felt to be more significant than those related to the combined flame. These may be summarised as:

1. Burner performance
   (a) With the 20-cu.ft. combustion chamber maintained above about 1,000°C, the low-pressure air blast oil burner used was capable of burning 200- and 900-second fuel oil with less than 2% excess air.
   (b) When the combustion-chamber conditions are less satisfactory, higher excess air is necessary, either to avoid smoke or to stabilise the flame. Under these circumstances, the addition of town gas to the fuel-oil flame can reduce the excess air and help to stabilise the flame.
2. Scale formation on carbon steels
   (a) With excess air values below 10%, town gas produces less scale than oil; at 30% excess air this is reversed.
   (b) Below excess air of 10%, change in excess air has little effect on total scale formation when town gas is used; with fuel oil, the effect is considerable because of the presence of the iron oxide/sulphide eutectic.
   (c) With bright mild steel, and at heating periods of two hours and above, 15% of town gas in the flame gives about two-thirds of the advantage of town gas over fuel oil in respect of total scale formation. However, this benefit

is, in any case, somewhat marginal, except possibly at two hours and 5% excess air.

(d) At excess air values below 10% town gas produces significantly less adherent scale. The mixed flame, however, behaves substantially as the 100% fuel-oil flame, Also, the advantage tends to disappear at higher values of excess air.

3. Scale formation on Ni-Cr-Mo alloy steel

(a) With excess air values below 10%, town gas produces less scale than oil; above this value the position is reversed.

(b) Troubles due to the iron oxide/sulphide eutectic are apparently slight.

(c) Scale loss from this steel was as high as from the carbon steels.

(d) The mixed flame produces more scale than either of the single fuels when the excess air is below 10%.

(e) At excess air values below 10% town gas gives the least adherent scale: This advantage disappears at higher values of excess air.

4. Decarburisation

(a) A general picture of decarburisation is obtained from 11 out of the 14 sets of curves presented, and in seven cases town gas appears to have given less decarburisation than fuel oil. Little can be said about the combined flame save that its behaviour is, on average, intermediate.

(b) In five cases, the combined flame is the least decarburising, but generally by a small margin.

A summary

These conclusions may be further summarised as:

1. *The use of town gas.* Town gas at low values of excess air can give low metal loss as scale, and low adherent scale. The excess air must be kept below 10% to obtain this advantage.

2. *The use of fuel oil.* Difficulties will appear if the excess air is reduced, especially with heavy oils with their generally higher sulphur content. Oil is always likely to produce more adherent scale than town gas in an efficient—i.e., minimum flue loss—furnace.

3. *The use of combined fuel.* There is little evidence to support the suggestion that disproportionate advantages can be attained by the addition of up to 15% of town gas to an oil flame. It must be emphasised that this finding relates solely to its metallurgical effects and does not prejudice the other advantages outlined above.

DISCUSSION

Abstracts follow from the discussion on this paper, which was presented at the 26th Autumn Research Meeting of the Institution of Gas Engineers in London recently.

Dr. R. S. Edwards, Chairman, North Eastern Gas Board:

Can we mix a cheap liquid fuel with a substantially dearer gaseous fuel and get a combined fuel which will do something which neither will do on its own, and at an attractive price?

First lesson

I think that the first lesson to learn from the paper is that the possible application of dual fuel flames cannot be defined by simple considerations of general principles. The paper contains in its early stages a particularly useful and interesting resumé of the thoughts on this subject which have been put forward from time to time.

It is clear from this study that each application has to be considered on its merits, as the authors have been careful to point out. Even although the principal conclusion of the paper is substantially negative with regard to the special problem of scale, it has brought out or, perhaps, re-emphasised the importance of excess air which, incidentally, means the importance of a renewed study of furnace design.

This paper should, therefore, be considered in the nature of a pioneer effort of controlled laboratory inquiry into what I believe is a great need of the industry at the present time.

In other words, the sort of work which is documented and presented in this paper could usefully give us information upon which furnace builders and industrial engineers could achieve rapid increases in the efficiency of utilisation of gas, and therefore the overall attractiveness of gas as a heating medium in industry.

Mr. L. Walker, West Midlands Gas Board: If we examine the results we see that under conditions of 5% excess air and for half hour heating period, the scale loss was 28.1 cg/sq.cm. for oil firing and 17.8 cg. per sq.cm. for gas firing.

This loss expressed as a percentage of the initial billet weight, which was 250 grammes, is 13.8% and 8.7% respectively. Thus, we have a saving of 5.1% metal if we adopt gas firing. Taking the cost per cwt. as 50s., this difference in percentage loss would mean a saving of aproximately 2s. 6d. per cwt.

This figure is probably on the low side since we have only considered the cost of the raw material, and have not taken into account the cost of purchasing it, delivering to the works, accepting into stores, booking out and transferring from the stores, cutting off to length and other costs.

On the other hand, of course, we are all aware that the fuel cost for gas firing can be more expensive than oil firing. For a basis of comparison today I have taken a figure of 2 therms per cwt., and with gas at 1s. 4d. per therm and oil at 7d. per therm, it is evident that for similar conditions of efficiency we have a difference of 1s. 6d. per cwt., in favour of oil firing, but considering the overall position, we have a difference of 2s. 6d. minus 1s. 6d., *i.e.,* 1s. per cwt. in favour of town gas.

Mr. W. H. Tarn, Wales Gas Board:

We put in a combined burner and ultimately ended up with a 50-50 gas/oil mixture. The firm concerned was not interested in thermal efficiency. It was mainly interested in output. Therefore, we were anxious to know if we could compete with an oil fired installation. Our results proved that we got an improved product; the scaling was not so hard, the life of the refractories was extended anything up to ten times, and we trebled the production rate which was required.

Applications

There are plenty of applications where oil is used and where it would be of great advantage to put in a combined burner. Although the outcome of the paper is perhaps somewhat negative, it is necessary as an interim stage to our ultimate aim.

It is necessary to bear in mind that the design of all industrial equipment is becoming far more specialised, and we cannot expect firms to convert everything over to 100% gas fired installations.

Mr. Foster, University of Sheffield:

Using four slot burners situated round a pressure jet gas/oil burner, we found that by introducing gas round this oil flame its emissivity was increased. A maximum increase in peak emissivity from .5 to .7 was obtained using 22% gas.

Mr. Tarn has mentioned that there is less refractory trouble with a gas/oil flame, and in the paper reference

is made to the fact that the gas/oil flame will give less refractory trouble due to there being less radiation or unburned fuel.

This would suggest that if a small amount of gas is used there should be more refractory trouble, if in fact this is due to radiation, and possibly less if it is due to unburned fuel.

In the case referred to 50-50 gas/oil was being used and the flame would be more or less a gas flame.

Mr. R. F. Hayman, Gas Council: There has been a good deal of discussion on finding the perfect mixture of gas and oil which started some years ago in the work of the International Flame Research Foundation at Ijmuiden.

Here the one objective was to discover the fundamental mechanism for being able to make the best use on a large scale of the available coke oven gas by mixing with the minimum amount of oil. Full use could then be made of the high emissivity of the resulting flame in promoting rapid rates of heat transfer.

Work at Ijmuiden was inevitably associated with and influenced by large-scale use of oil in steel works, and for instance in the glass industry, and there remained for the gas industry the need to examine a combination of oil and gas in the many thousands of relatively small-scale billets and process heating furnaces in the country.

In such equipment incidentally the use of high emissivity is not by any means the best way to produce rapid heating. There were and probably still are varying schools of thought on this work, one being that the development of the combination burner could make it easier for customers to change over from gas to oil.

A change?

I believe that if the customer wishes to make such a change he will do so as soon as he can, regardless of the existing equipment, and I saw opportunities in the authors' work to discover whether a combination of oil and gas was likely to be a better fuel technically than gas alone.

The fact that the authors suggest it is not in itself a most important discovery, and in pinpointing their conclusions we must take greater heart and go out and sell gas for those processes now inadequately served by oil.

They've changed their name

The Electric Resistance Furnace Co., Ltd., a member of the EFCO group of companies, changed its name to EFCO Furnaces Ltd. with effect from December 1.

The change became desirable due to the increased scope of the Company's interests, which were originally confined to electric resistance heating but have in recent years been widened to include both gas and oil-fired furnaces.

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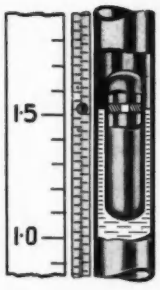

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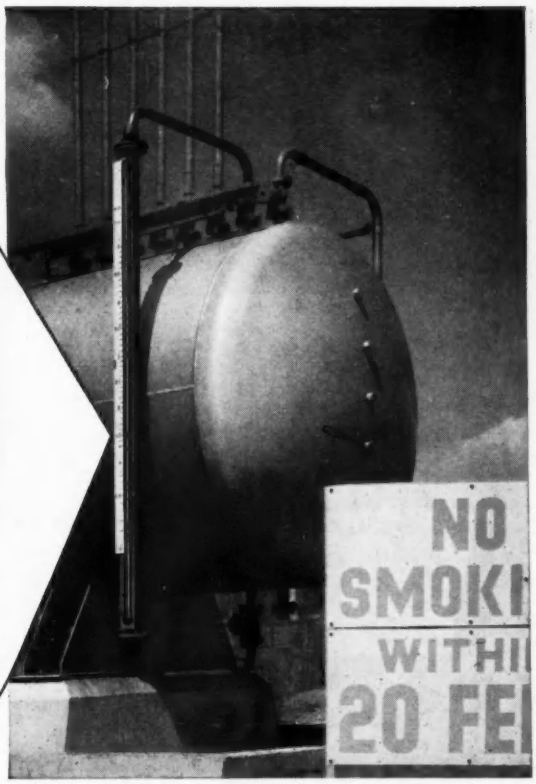

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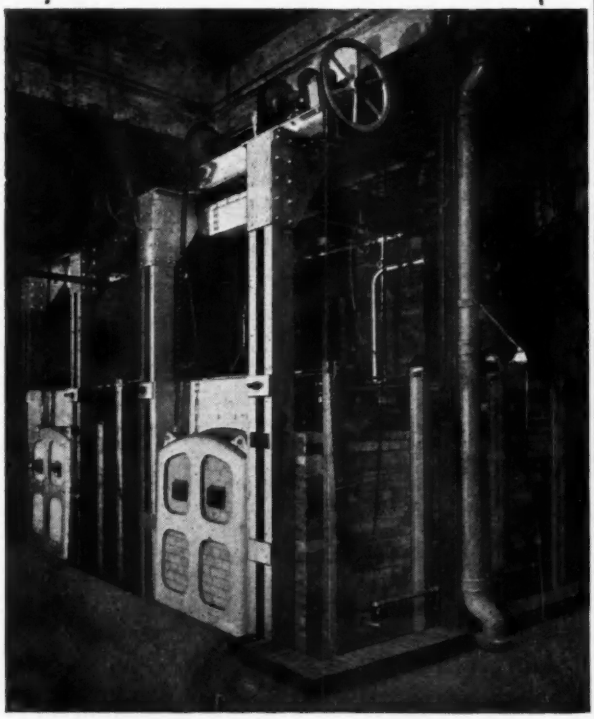

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